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ON the INFLUENCE of MINOR MERGERS on the RADIAL ABUNDANCE GRADIENT in DISKS of MILKY-WAY-LIKE GALAXIES

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Abstract

© 2015. The American Astronomical Society. All rights reserved. We investigate the influence of stellar migration caused by minor mergers (mass ratio from 1:70 to 1:8) on the radial distribution of chemical abundances in the disks of Milky-Way-like galaxies during the last 4 Gyr. A GPU-based pure N-body tree-code model without hydrodynamics and star formation was used. We computed a large set of mergers with different initial satellite masses, positions, and orbital velocities. We find that there is no significant metallicity change at any radius of the primary galaxy in the case of the accretion of a low-mass satellite of 109 M⊙ (mass ratio 1:70) except for the special case of a prograde satellite motion in the disk plane of the host galaxy. The accretion of a satellite of mass >~3 × 109 M⊙ (mass ratio 1:23) results in an appreciable increase of the chemical abundances at galactocentric distances larger than ~10 kpc. The radial abundance gradient flattens in the range of galactocentric distances from 5 to 15 kpc in the case of a merger with a satellite with mass 3 × 109 . There is no significant change in the abundance gradient slope in the outer disk (from ~15 kpc up to 25 kpc) in any merger while the scatter in metallicities at a given radius significantly increases for most of the satellite's initial masses/positions compared to the case of an isolated galaxy. This argues against attributing the break (flattening) of the abundance gradient near the optical radius observed in the extended disks of Milky-Way-like galaxies only to merger-induced stellar migration.

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Keywords

galaxies: abundances, galaxies: evolution, galaxies: kinematics and dynamics